Successful
Methods

McGraw-Hill
Publishing Company, Inc.
James H. McGraw, *President*
E. J. Mehren, *Vice-President*

For the Field Man
In the Construction Industry

William Jabine
Editor

Volume 8 NEW YORK, JUNE 1926 Number 6

The Field Man

A Mighty Force in the Industrial World

THE Builder has always been an important man in history. His works tell us of the power of the Pharaohs, the love of beauty of the Greeks, the splendor of Rome, the religious fervor of the Middle Ages. He built pyramids and palaces, canals and cathedrals, reservoirs and roads. He built well. Time has damaged his works but has not subdued his skill.

His direct heir today is the field man in construction and industry. And a worthy heir he is.

Do you want a bridge across a chasm? He'll tackle the job, no matter how hard.

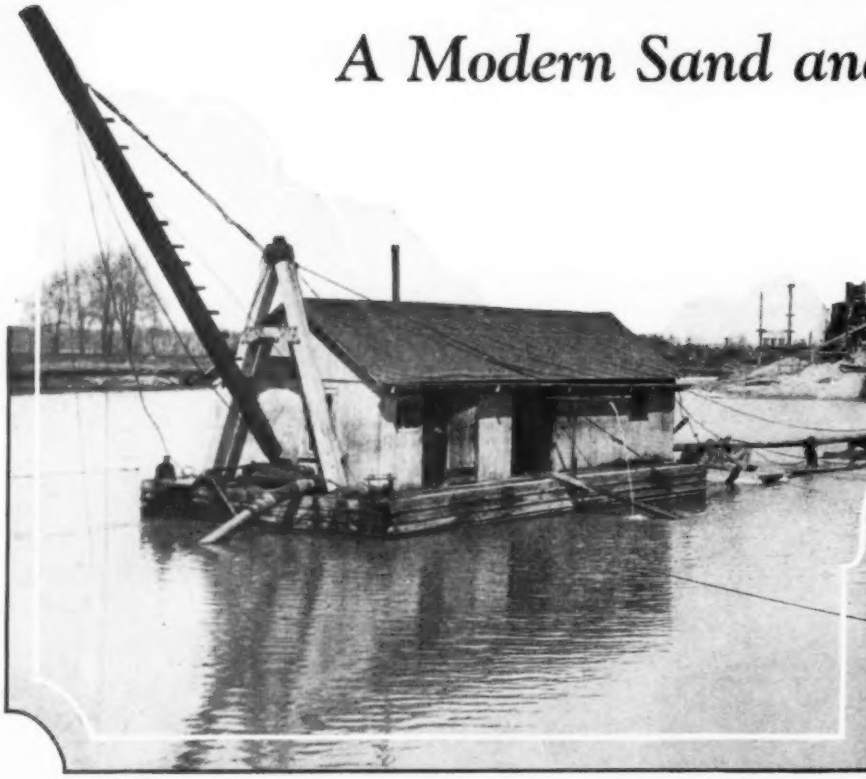
Do you want to dam a raging stream? Just give him the lines; he will check the torrent.

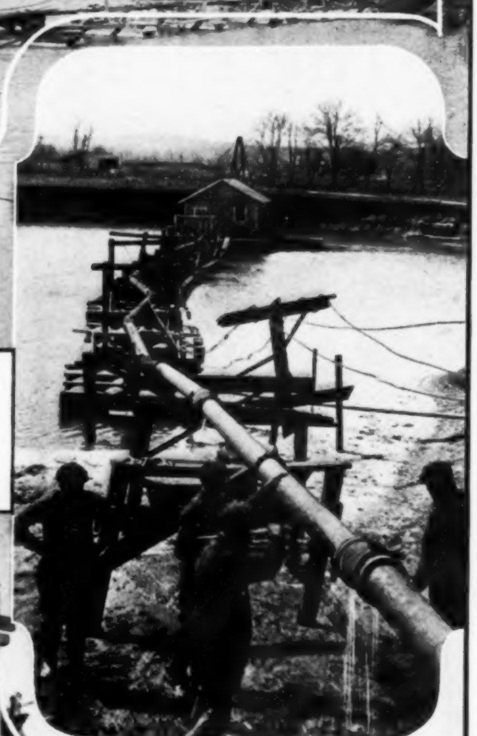
Do you want a skyscraper? Just tell him where and when.

Do you want to move mountains of dirt, or rock or ore? Drop him a word and watch him collect an army of steam shovels, drag lines, derricks, ditchers, loaders, dump cars—a mighty array of digging, breaking, lifting, carrying machines that glory in hard work.

And with them, guiding them in their herculean tasks, the field man carries on the never-ending work of the builder.

A Modern Sand and Gravel Plant



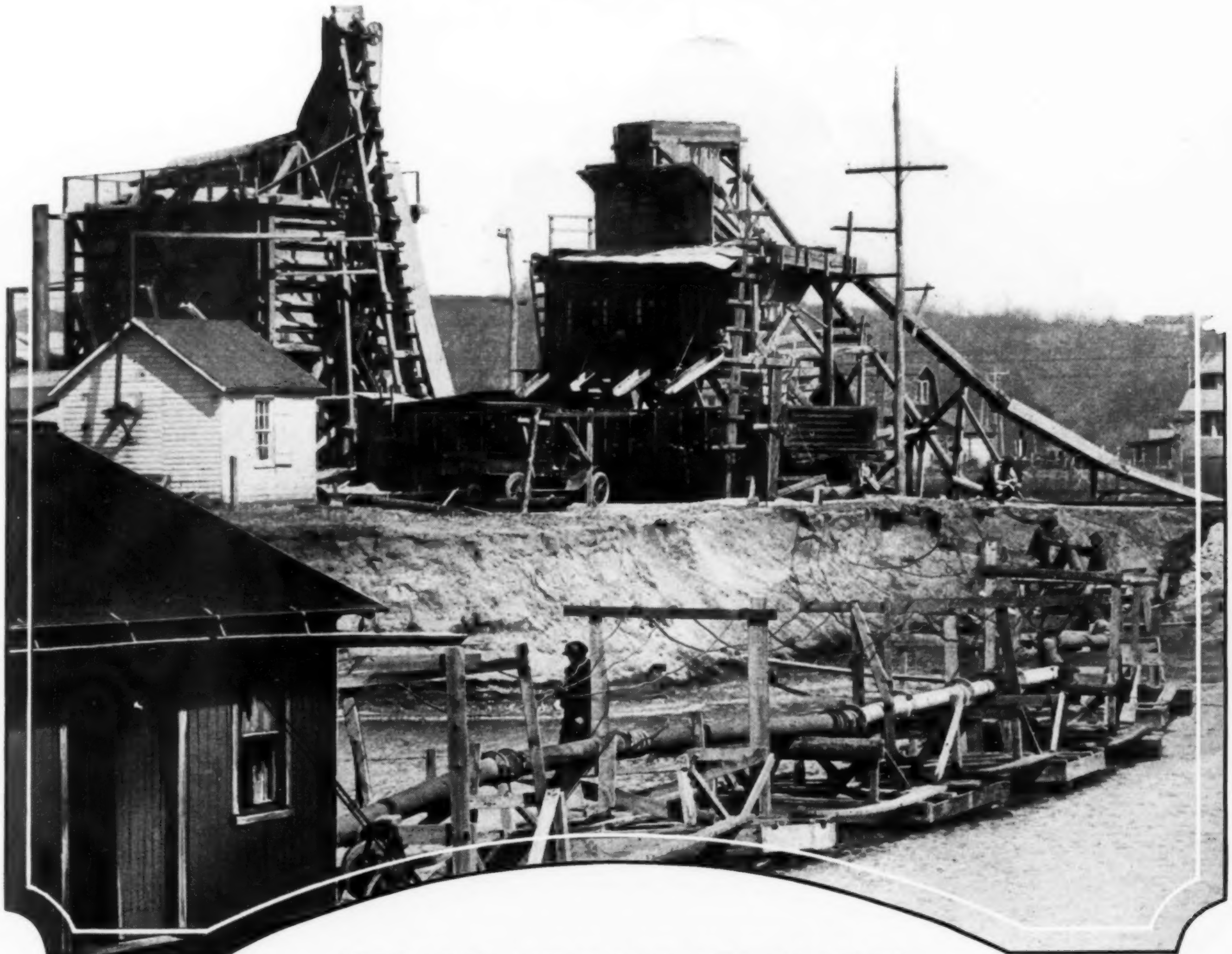


© Galloway.

The production of sand and gravel for construction work is an important industry and these photographs show the methods in use in northern New Jersey. Materials are obtained under water and are carried through a pipe line to the washing and screening plant. © Keystone.

© Galloway.

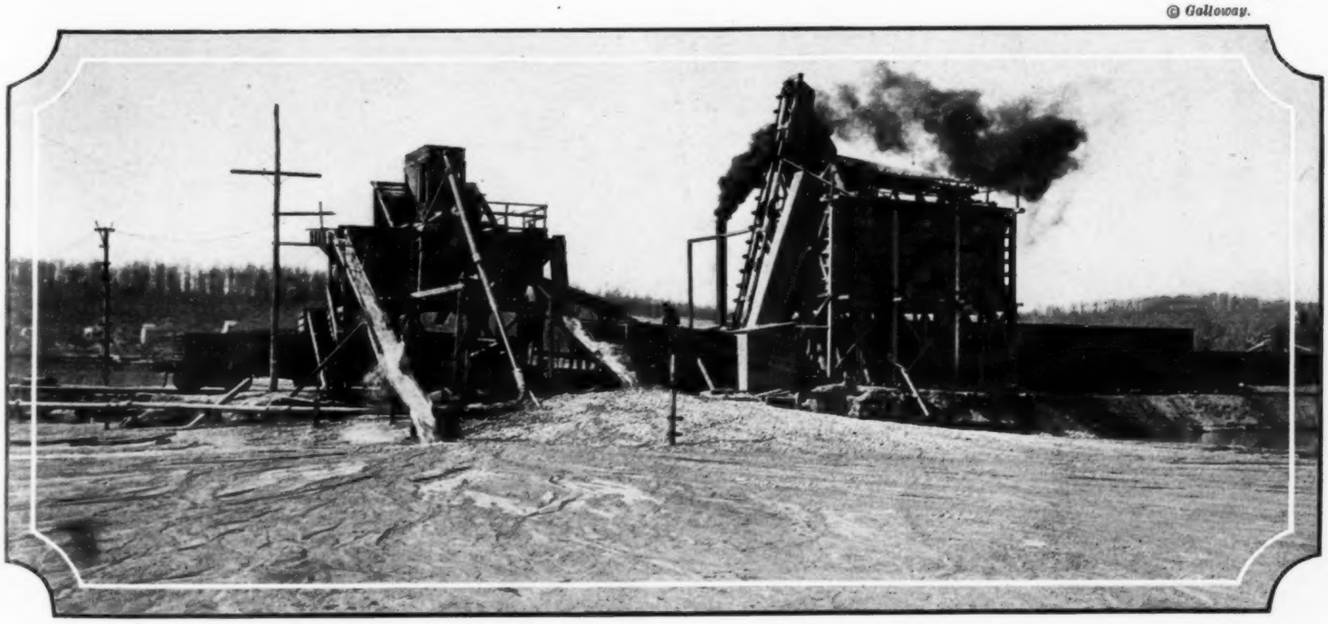
in Northern New Jersey



© Galloway.

The two photographs on this page show the sand and gravel plant of Ridner Brothers at Succasunna, N. J. This is a well-equipped plant which supplies construction materials to contractors in the neighborhood of Newark and New York.

© Galloway.



Big Ball Room Requires Special Construction

Four Trusses With Span of 86 ft. Used in Stevens Hotel in Chicago

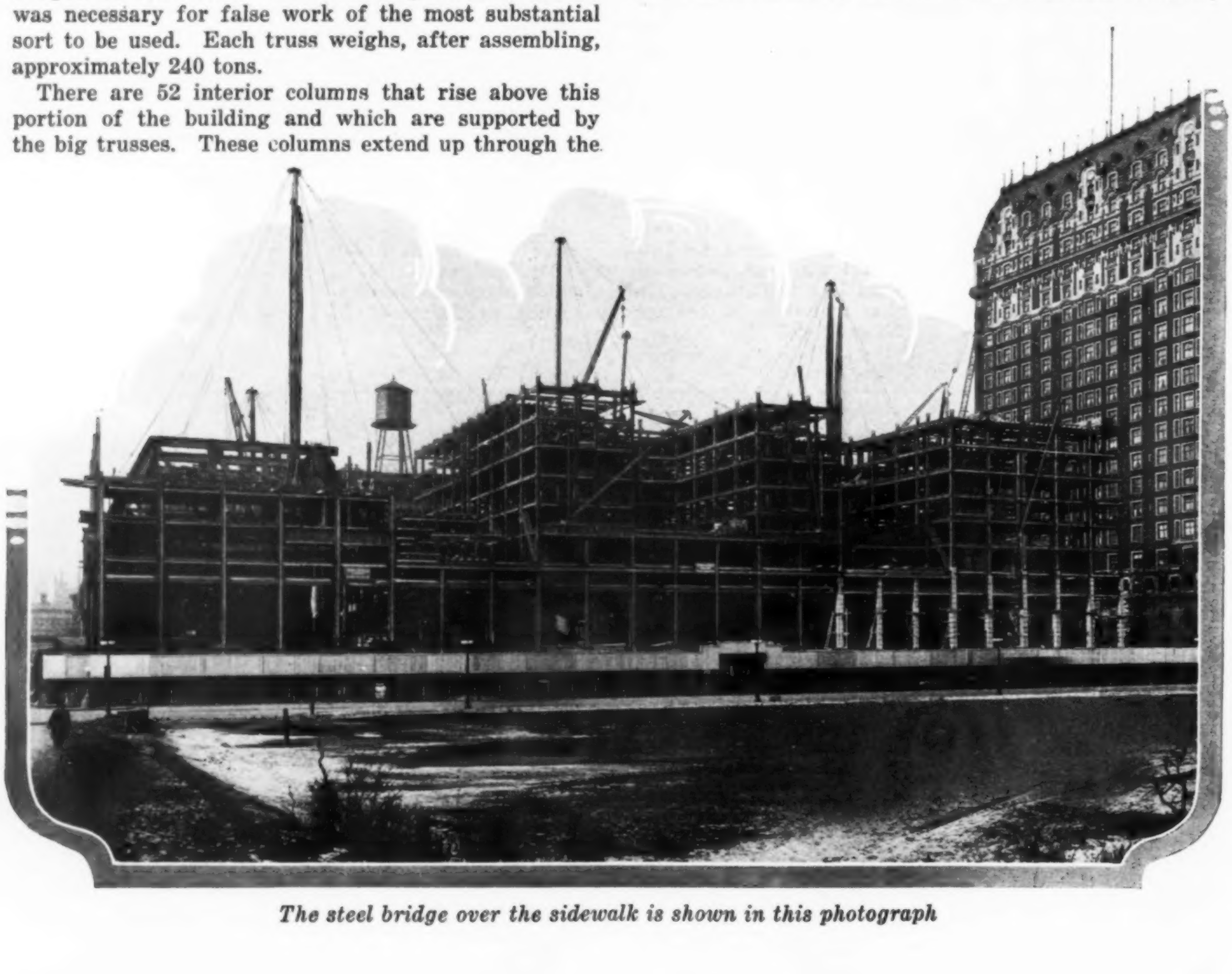
ONE of the greatest hotels in the United States is now being built in Chicago. The Hotel Stevens on South Michigan Boulevard occupies a block on that famous thoroughfare and it takes only 8 Chicago blocks to make a mile. The new hotel was designed by Holabird & Roche, Chicago architects, and is being built by the George A. Fuller Company. Work was begun in April of last year and was carried on during the winter months. It is expected that the big hotel will be finished next fall.

In order to provide a large open space free from pillars for the grand banquet room and ballroom on the second floor, it was necessary to install steel trusses of unusual strength to sustain the tremendous burden that they will be called upon to bear. The banquet hall is 84 ft. wide by 169 ft. long and will have a floor space of more than 14,000 sq.ft. without an obstruction. Four big trusses were required for this construction and the truss span is 86 ft. center to center of pins. The trusses are of the bridge type, a combination of pin and riveted truss and all individual members of the truss are held in place by pins. The sectional area of some parts of the truss members is equivalent to 3 sq.ft. of solid steel. In assembling these trusses it was necessary for false work of the most substantial sort to be used. Each truss weighs, after assembling, approximately 240 tons.

There are 52 interior columns that rise above this portion of the building and which are supported by the big trusses. These columns extend up through the building to support the 22 stories that rise above. The special precautions that were taken to insure safety above the great ballroom can be realized when it is considered that there are in all more than 350 girders and trusses used in this section of the fourth and fifth stories. All of the structural members are concealed. Some of the auxiliary girders are 12 ft. or more in length. In some cases these girders have large openings cut through their webs to allow the corridors to pass through.

These four big trusses are carried on eight columns which are supported on concrete piers that extend down to rock about 100 ft. below grade. The caissons vary from 9 to 11 ft. in diameter and are filled with a rich mixture of concrete. On top of the caissons are large steel slabs 8 ft. in diameter and 1 ft. in thickness. These slabs serve to distribute the load. The eight columns are 78 ft. from base to center of pin hole at top. They are built in one piece and weigh about 80 tons each.

In building the Hotel Stevens, a new device for the protection of pedestrians has been used to good advantage. It has provided a maximum of safety and has also combined utility with its other desirable features,



The steel bridge over the sidewalk is shown in this photograph

Two of the big trusses over the ballroom may be seen in this picture

as a great deal of building material has been safely stored upon it. It also can be used over and over again on successive construction jobs.

This steel sidewalk protection bridge is built in standardized sections. The columns are 4-in. steel pipe and the supporting I-beams are 8-in. 25½-lb. per ft. steel I-beams. The connecting pieces are 1½-in. steel pipe. On the steel I-beams a wooden nailing strip is bolted to provide for attaching the wooden beams. These beams are spaced according to the span, and lap one another at each bent, so that there is no necessity for expensive cutting or fitting.

The method of erection is simple. First, the heavy wooden sills are laid out on the sidewalk. The steel I-beams are laid across the sidewalk, and each column head is clamped to it in its right position. Then each steel column with the flange already fitted on is up-ended in the cylindrical barrel portion of the column head. The complete bent is then raised into position on the sidewalk at one time and the flanges at the bottom of the columns are fastened to the heavy wooden sills by means of lag screws. All connections are made by clamps tightened by eye-bolts. The parapet can be framed in a neat manner, providing a panel effect along the front. This equipment is furnished by the Patent Scaffolding Co. of Chicago.

Shirley Takes Office As President of Road Builders

THE annual meeting of the American Road Builders' Association was held in New York City on Friday, May 15th at the Engineers Club. At the annual dinner which preceded the meeting, the new president of the Association, H. G. Shirley, Chairman of the State Highway Commission of Virginia, who was elected last January, took office. The retiring president, W. H. Connell, Engineering Executive of the Pennsylvania Highway Department, made the principal speech of the evening, emphasizing the necessity for increased attention to the task of making the highways safe for traffic after they are built.

Huge Steel Structures Help Build Subways

New York Street Shadowed by Overhead Trolley Cranes Working on New Underground Route

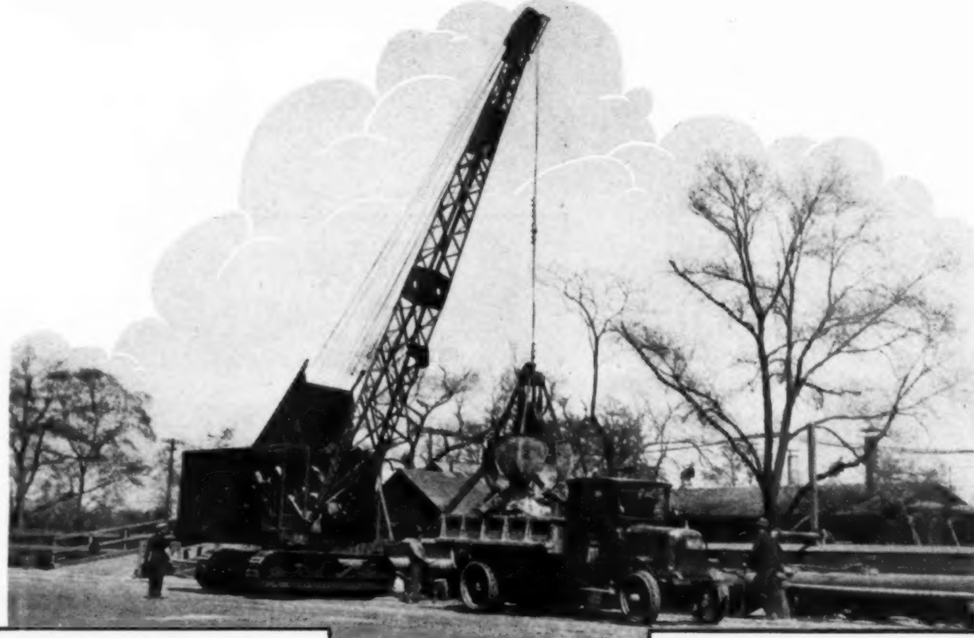
NEW methods and plant for handling subway excavation have been introduced by Frederick L. Cranford-Charles H. Locher, Inc., of Brooklyn, N. Y., contractors on two sections of the Eighth Ave. subway in New York, now under construction between 38th and 48th Sts., and between 58th and 68th Sts., respectively. The outstanding feature of the plan the contractors have developed for removing excavated material from the cut and loading it into motor trucks for disposal is the use of overhead trolley cranes or telphers supported by huge movable structural steel bridges. Each of these big structures has an overall length of 190 ft. They are located at the curb line of the street and run parallel to it.

These steel carriages are impressive structures, resembling great steel bridges. They are shown plainly in the large photograph at the bottom of page 6 and in the two photographs on page 8. Their great size can easily be realized by the way they loom up over the taxicabs and other vehicles along Eighth Avenue.

To expedite the work on the 38th-48th St. section, where Eighth Ave. carries an exceedingly heavy vehicular traffic, two of these rigs are being used, one on either side of the street, while on the 58th-68th St. section, along the broader and less heavily traveled thoroughfare of Central Park West, only one rig is operated. It is on the east side of the street.

In its essential elements the plan is an adaptation to construction work of standard industrial material-handling methods and equipment common in manufacturing or power plants for the handling of coal, cement, fertilizer, and other materials in bulk. On the subway work, after the street is opened up and decked over

The big steel trolley crane which handles the work on the Cranford-Locher organization's uptown contract. Howard Robinson, superintendent of this job, at the right



Subway digging beside Central Park

At Contractor's Yard: Oxy - Acetylene cutting (left) and Bucket Repair (right)

with planking to carry traffic, special low-clearance power shovels, supplemented by a certain amount of hand labor, take out the cut and deliver the excavated material to 1½-yd. skips.

The trolley cranes, of which there are two on each of the long steel bridge carriages, pick up the loaded skips and carry them along overhead tracks to the cantilever ends of the truss frame, where they are dumped into motor trucks. This system makes possible great flexibility in the excavating and loading operations, as skips can be filled at any number of points along the length of the trolley crane travel (190 ft.) and picked up successively by either of the two hoists on each rig.

The bridge-like carriage for each rig, as shown in the illustrations on pages 6 and 8, consists of a pair of heavy steel truss frames, 140 ft. long between column supports with a 25-ft. cantilever overhang at each end. Four columns carried on four-wheel carriages support the overhead structure. The wheels under the columns are double flanged and ride on a pair of heavy rails spaced 13 ft. 3 in. on centers and supported, in turn, by longitudinal steel girders carried on vertical posts extending down to subway grade. The main trusses have a clearance of 14 ft. above street level and with their clear span, between columns, of 140 ft. they can operate at cross-street intersections without interfering with vehicular traffic. As the subway excavation at any section covered by the length of the trolley crane travel is completed, the main bridge carriages, on their wheel supports, are moved along their tracks at street level by a cable passing around a snatch block to a deadman, pulling power being supplied by the trolley crane.

The two crane-hoist elements of each rig, running on a pair of overhead rails, mounted between the bridge trusses, are electrically operated by three motors (two 40-hp. for hoisting and one 20-hp. for traveling) from

a hanging carriage, giving the operator a clear view for controlling hoisting, traversing and dumping. Each hoisting unit, manufactured by the Harnischfeger Corp., of Milwaukee, has a rated capacity of 5 tons. Alternating current is delivered by a three bus-bar system and the drive is by gear and pinion. There are two double-grooved hoisting drums on each crane. The vertical hoisting speed is 150 ft. per minute and the horizontal traversing speed is 250 ft. per minute. Current is 60-cycle, 3-phase, 220 volts. All working parts are enclosed in dust-proof oil-tight cast-iron cases.

On the downtown section of the two contracts the excavated material, at this writing, is being handled by skips. On the uptown section, however, the trolley crane is operating a clamshell bucket, which, in addition to digging material direct from the cut, rehandles earth

The 38th-48th Street section. The lower photograph shows the two steel trolley cranes, one on each side of the street

moved over from the west side of the route by means of a dragline scraper.

As soon as work has progressed sufficiently on both contracts, power shovels, two for each section, will be introduced to load the bulk of the excavation into skips for hoisting by the trolley cranes.

In addition to the overhead trolley crane rigs described, the contractors are making extensive use of six gasoline-powered locomotive cranes mounted on crawlers, in addition to a seventh crane on a motor-truck mounting. These mobile units have a wide range of application in handling the lumber and steel for the street decking, operating orangepeel buckets for opening up the street surfaces, handling skips, and placing and removing mats for blasting operations. Typical views of the locomotive crane operation are shown herewith.

The 38th-40th St. contract, on which Henry A. Hansen is superintendent, will cost $7,866,000, while the second section, between 58th and 68th Sts., where Howard Robinson is superintendent, will involve an expenditure of $5,970,000. The work on both contracts is being done by Frederick L. Cranford-Charles H. Locher, Inc., of Brooklyn, under the direction of the Board of Transportation of the City of New York, of which Robert Ridgway is chief engineer.

Just at present New York City is in the throes of a great subway building program. There are about 15 miles of subway actually under construction and this work has been let in about 30 units. The Eighth-St. Nicholas Ave. subway alone is about 11 miles long and the work has been let in 22 units. This means that 30 contractors are at work digging subways in different parts of the city and the jobs are progressing enough to make it possible to devise and use big construction units such as those described in this article. At present more than $100,000,000 worth of work is under way.

Locomotive crane loading truck

Henry A. Hansen, superintendent of the downtown section

The photograph below shows the drilling gang at work in the bottom of the excavation

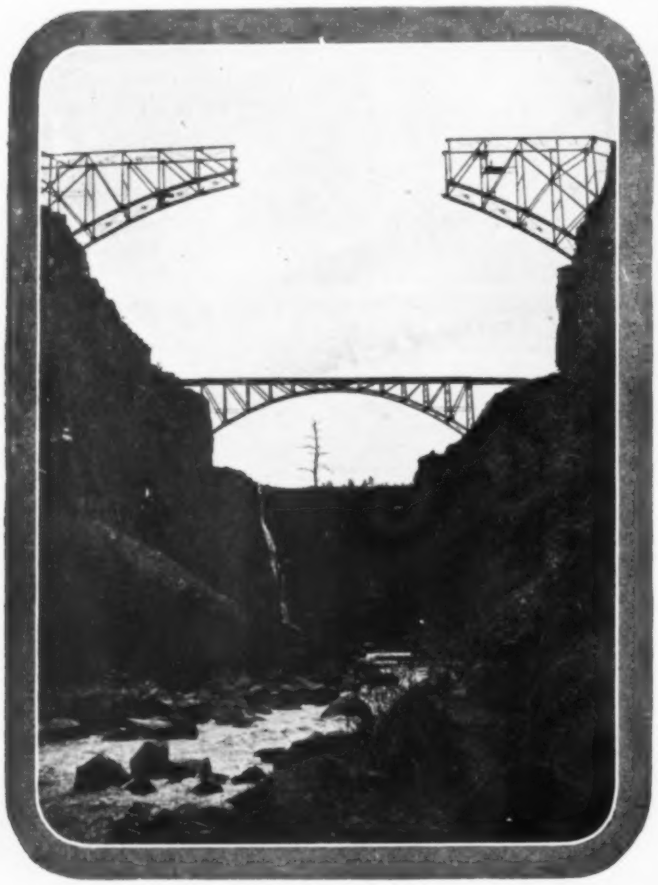
Highway Bridge Spans Deep Gorge

Oregon Builds Steel Structure High in Air Above Crooked River

SPANNING a chasm in the center of a Central Oregon desert 330 ft. wide and forming the last link in the Dalles-California highway, one of the highest modern highway bridges in the United States, has just been completed across the Crooked River.

For ages this small but swift stream has been cutting its way through solid lava rock until today the river flows more than 300 ft. below the level of the surrounding country. Through the action of the water a gorge has been worn, so deep and narrow that to a person in the bottom of the canyon the sun sets shortly after noon. The walls of this gorge are straight up and down and marked with strange designs and figures, due to faults in the rock itself and to the peculiar action of the different lava flows. It is a spot rich in scenery and history and has become a place of commanding attention to the auto tourist, who in the past has had to drive his car up the side of the canyon over an old wagon trail, rough, narrow and dangerous.

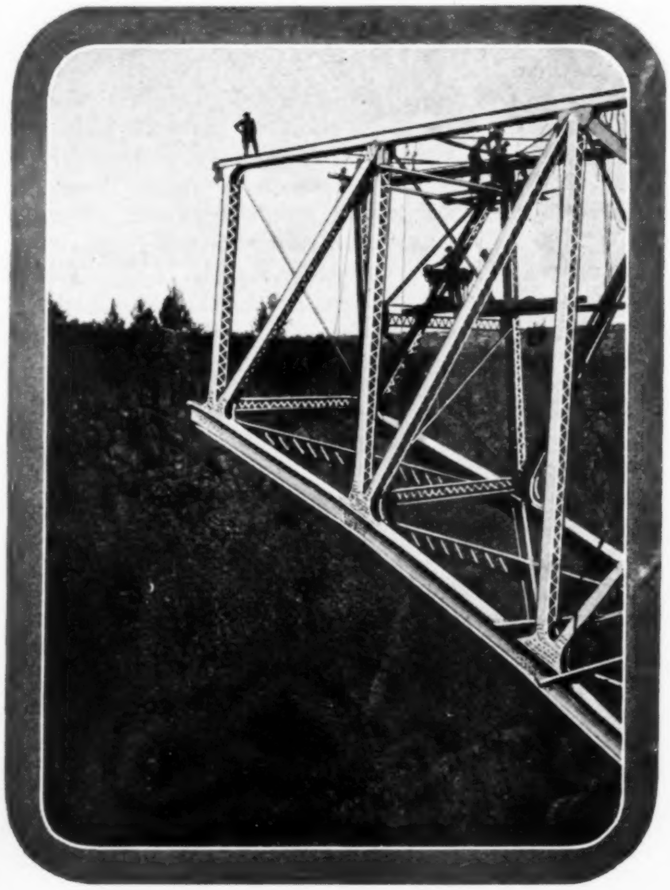
At a spot in this gorge where the walls are straightest



The new bridge reaching across the canyon

and closest together the Oregon State Highway Commission has just finished a modern steel bridge. The structure is of the cantilever type, 330 ft. 8 in. long and 302 ft. from the steel to the river. The general contract for this bridge was let to Kuckenberg & Wittman, of Portland, Ore., and the steel was erected, on a sub-contract, by Booth & Pomeroy, also of Portland.

The abutments were blasted out of solid rock from the face of the cliff, which forms so strong a base that only a very small amount of concrete was used, just enough to set the base of the hinges in. Two large



The steel workers on the job

gin poles were erected, one on each bank of the canyon, and material was carried across on a high line cableway. These gin poles were set on a slant, so that they could be swung from one side to the other and material lowered from over the center of the gorge to whichever side of the bridge the men were working on. The steel and other materials were handled from one side only.

Riveting crews worked on movable platforms hung on ropes, and air was furnished by two compressors, one on each side of the canyon and connected by an aërial air line. No water was available for the donkey on the plateau so a triple valve pump was installed at the river's edge, and this little machine pumped water 320 ft. up to the boiler on the bank above it.

The steel in the bridge weighed 500 tons, but the structure is comparatively a slender one. It is so high that great crowds of sightseers have been attracted to the scene every day since the work started, to watch the iron workers put the steel together.

This immense opening in the earth is not visible to the auto tourist from a distance as the walls of the

precipice drop straight down. The effect on the tourist when he comes suddenly face to face with such a breathtaking chasm, after driving for miles across a typical Central Oregon desert on a smooth macadam road, can be imagined, and the spot is of such attraction to travelers that the state has obtained sixty acres around the approaches to the bridge which will be used as a park and accommodations provided for those who wish to stop, take pictures and enjoy the wonderful scenery.

The last of the steel work was put in place in April and with little ceremony, the immense jacks which hold the separate units of the bridge to the banks, were loosened, allowing the structure to come together in the middle. The date of the final lowering into place was not given out to the public, Chris Fauersa, engineer in charge of the construction, fearing for the safety of people who might get too close to the edge of the banks in an attempt to watch the proceedings.

Machine Made Manholes

Ditcher Varies Monotony of Cutting Trench by Taking on Extra Work

A MACHINE which will do more work than its owner bargained for when he bought it is sure to be a valuable unit in any construction plant. The Pacific Gas & Electric Company, having bought a Barber-Greene ditcher for the purpose of cutting trenches in which to lay conduit, dug a manhole with the machine one day to see how it would work. The operation proved so successful that ever since, the ditcher has alternated between cutting trenches and digging manholes, although of course the trench work occupies the greater part of its time.

The men in charge of the ditcher have worked out their own method of digging manholes and have succeeded in establishing the schedule of about 45 minutes for digging a manhole 10 ft. long, 8 ft. wide and 5 ft. deep.

When a manhole is to be dug, the job is laid out on the subgrade. Next, the position of supporting planks are laid out with chalk to template, and the planks are put in position for the first cut.

The ditcher mounts to the planks and the boom digs to the desired depth, usually 5 ft., with the conveyor discharging at its extreme extended length. After the ditcher has reached the desired depth, it cuts at this depth across the space open.

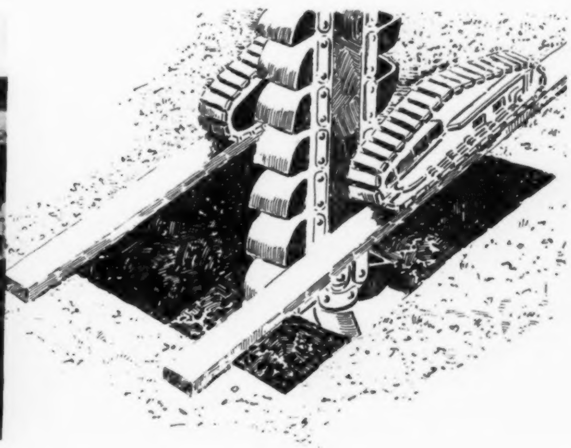
After the first cut is made, the boom is raised and the machine is backed clear of planks. The planks are placed for the next cut, overlapping the last cut made. The ditcher mounts them and makes another cut. This operation is continued until the hole is *half* completed.

At this period, the machine is turned end for end and starts digging from the opposite side of manhole. This operation eliminates the necessity of changing the conveyor to discharge on the other side of the machine. It is no trick to maneuver the machine. If the cut were not made in the opposite direction and the conveyor not changed the spoil would go back into the dug position of the manhole.

The description of this operation may sound a bit complicated in writing, but the Pacific Gas & Electric Company reports that it is very simple and results in a substantial saving in both time and labor. The job illustrated in the photograph at the bottom of this page was begun at 8 a.m. and completed at 8:48 a.m. exactly. At 9 o'clock the ditcher was operating again on the connecting trench from which it had been taken temporarily.

The saving in labor can be estimated approximately as follows: One man with pick and shovel can dig an average of 180 cu.ft. of this material in 8 hr., while the Barber-Greene can dig 400 cu.ft. of the same material in less than 1 hr. Figuring 22.5 cu.ft. per man per hour hand digging, the Barber-Greene ditcher in this class of work equals the work of eighteen men. The machine dug manhole also is not subject to some of the variations in shape and size that so often occur when such work is done by hand.

The photograph and drawing below show how the work was done. The drawing illustrates the manner in which the planks are braced in digging the manhole.



Ditcher digging manholes—the drawing at the right shows method of supporting machine

Setting Stone by Telephone

TEAM work is necessary for profit making on every construction job, and when the men who have to work together are so situated that each is out of sight and hearing of the other, team work becomes anything but easy.

The Stever-Hubbard Company of Detroit has solved such a problem on the Genesee County Court House job at Flint, Michigan. Four Clyde gasoline hoists placed on the roof of the building are being operated by the Stever-Hubbard organization, which has the contract for setting the stone, the F. R. Patterson Construction Company also of Detroit being the general contractors.

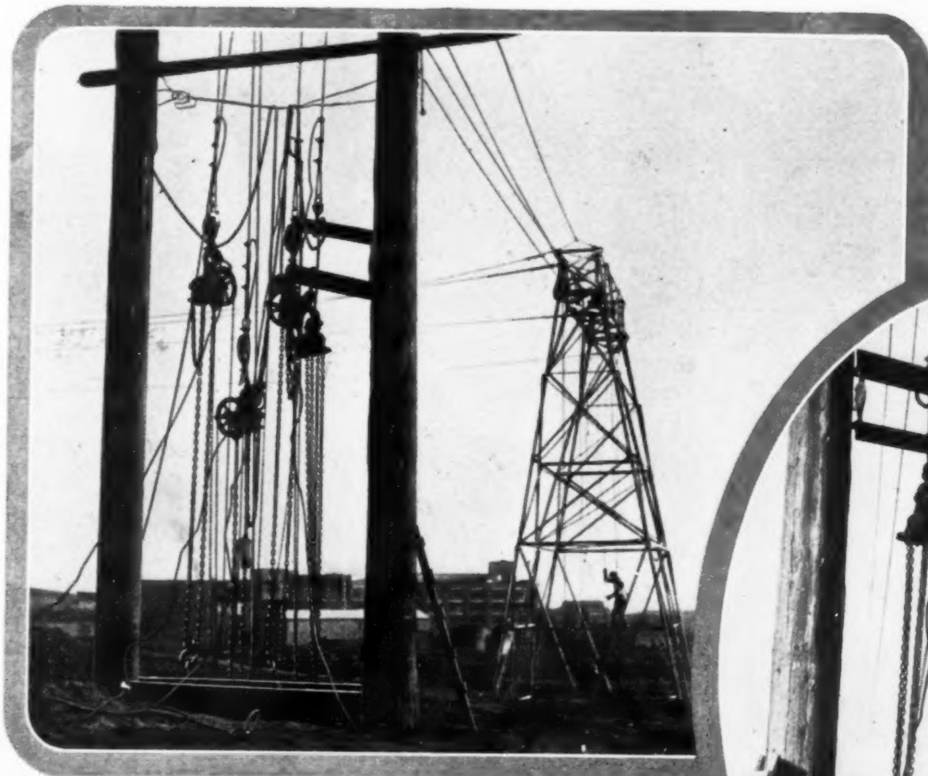
As the hoists are so situated that the masons setting the stone cannot see the operators, a telephone line has been rigged up between them. The masons wear transmitters and the hoist operators are equipped with head set receivers. This method of communication was devised by F. H. Stever and has proved satisfactory in every way. The men setting the stone are able to instruct the hoist operators far better than they could by a bell signal or by having another man transmit visual signals.

It would be possible, of course, to conduct a two-way conversation over the telephone line, but Mr. Stever has found that such an arrangement does not work out so well. The stone setters and hoist operators are likely to grow chatty and spend too much of their time exchanging reminiscences or telling each other the latest stories. With the one-way line, all temptation on this score is eliminated as it is no great satisfaction to tell the other fellow a good story when you cannot see him smile or hear him laugh.

The new Court House is a 6-story structure faced with Indiana limestone. The facing calls for the setting of about 25,000 cu.ft. of this stone and all of it is being handled by the four gasoline hoists, two of which have seen service for several years on various construction jobs.

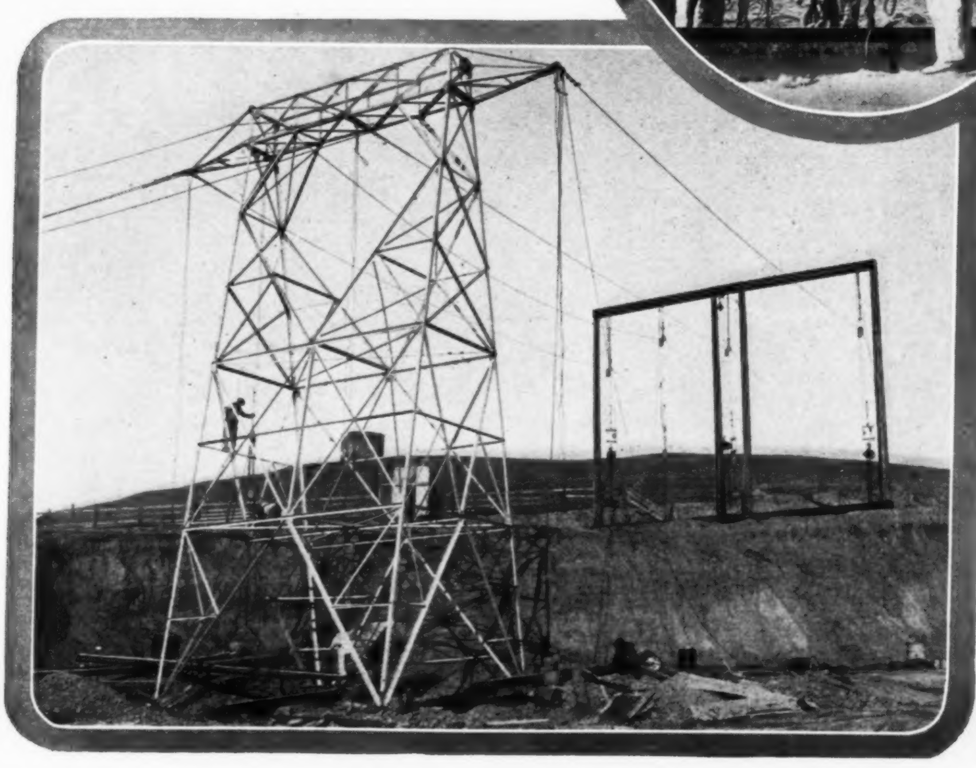
Telephone line connects stone setters in center of photograph with hoist operators on roof

Testing Transmission Towers



These three photographs show tests being made on transmission towers which are to be used in the high Sierras in California. The tower shown in the photographs was subjected to various stresses

© International.

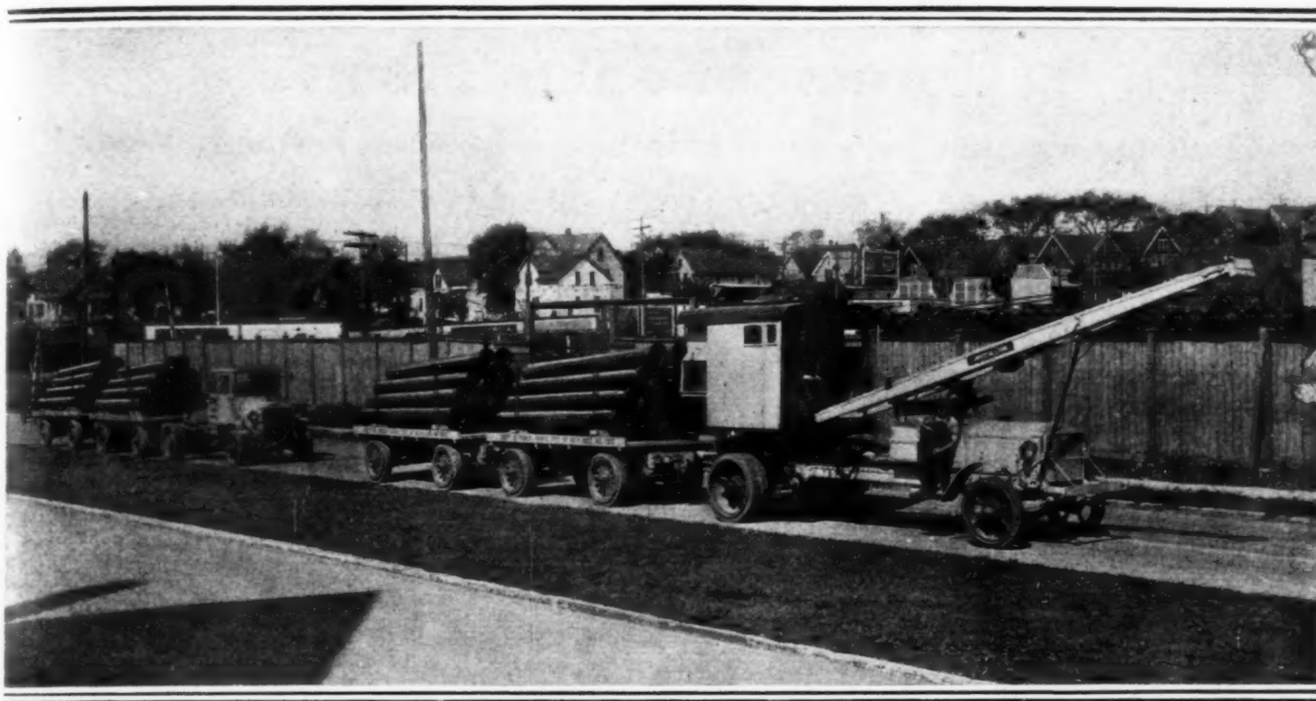


Pipe Handling with Truck-Mounted Cranes

HANDLING heavy pipe always has been an awkward sort of job and contractors and public service companies have consistently fluctuated between hand labor and machines for this work. Three of the photographs which accompany this article were taken in different cities and show how the same method of handling pipe has been adopted at widely separated parts of the country. In each case, a Universal crane mounted on a motor truck is taking care of the job.

The fourth photograph shows the old-fashioned pipe

Loading pipe by hand labor is slow and expensive work

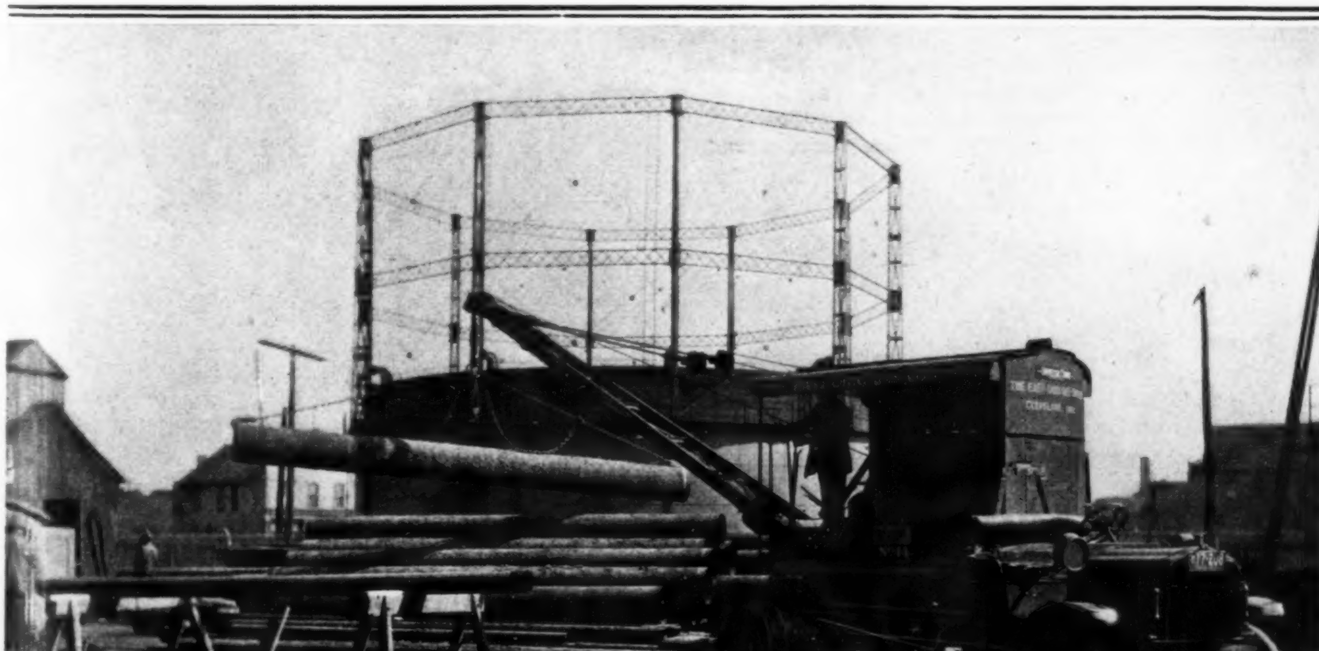


A truck-mounted crane in Milwaukee loads the pipe and then hauls it

handling gang hard at work, six men straining every muscle to load slowly a section of the pipe which a crane could pick up in less time than it takes to tell about it.

The City of Milwaukee uses a Universal crane not only for unloading pipe, but also for hauling two trailers on which the pipe has been loaded. The photograph at the top of this page shows the Milwaukee outfit.

The lower photograph shows a crane owned by the East Ohio Gas Company of Cleveland handling joints of steel gas pipe weighing 1,500 lb. each. The crane with its operator and 3 men unloaded 50 of these joints in 30 minutes, while it took 12 men 3 hours to do the same job by hand labor.



This Cleveland crane has handled many miles of heavy steel pipe

Turning Slag Into Profits

Buffalo Organization Is Pioneer in Use of Material Formerly Wasted

SOME months ago *Successful Methods* described the way in which blast furnace slag is disposed of in the Pittsburgh and Youngstown, Ohio, districts. Low waste land is converted into valuable industrial sites by filling in with slag which is handled in large air dump cars.

Another use for the slag has been found by the great steel industries in the Chicago district, which convert most of their slag into cement. The Universal Portland Cement Mills at Buffington, Indiana, are among the largest in the world, and they are so situated that they can utilize the slag from the big steel plants.

A third standard method of disposing of what otherwise would be a waste product is to crush it into material of proper size for concrete aggregate and railroad ballast.

These three successful methods of making something out of nothing have given slag, formerly a waste product, a standard value. Instead of paying out good money to get it hauled away and disposed of, as they once were obliged to do, iron and steel companies now have no trouble in selling all they make or collecting a royalty on each ton that is moved away from the plant. Practically every steel center where there are blast furnaces have complementary industries engaged in the utilization of slag.

The Buffalo Slag Company of Buffalo, New York, was organized about 13 years ago and was one of the first concerns to engage in the utilization of slag in that State. This company takes the slag from the 21 blast furnaces in the Buffalo district and handles about 1,500,000 tons of the material every year. Much of the slag is converted into excellent road building material or railroad ballast.

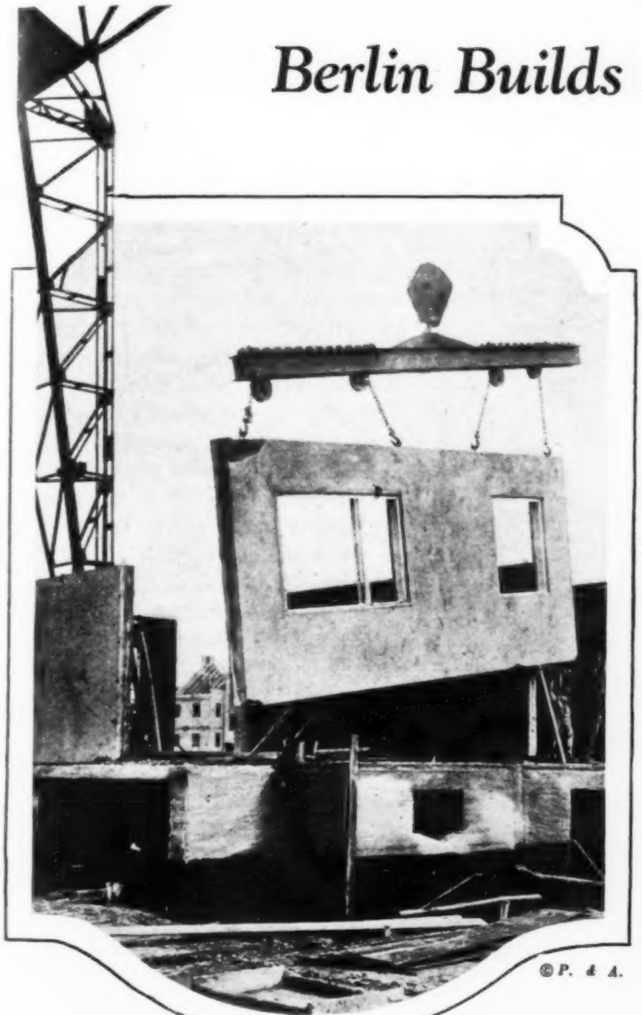
The Buffalo Slag Company has three semi-central crushing plants through which the blast furnace slag is passed for crushing into six sizes.

The newest use for this material is as sand for concrete. Its preparation requires special treatment but slag-sand from the plant of this Buffalo concern is in successful use.

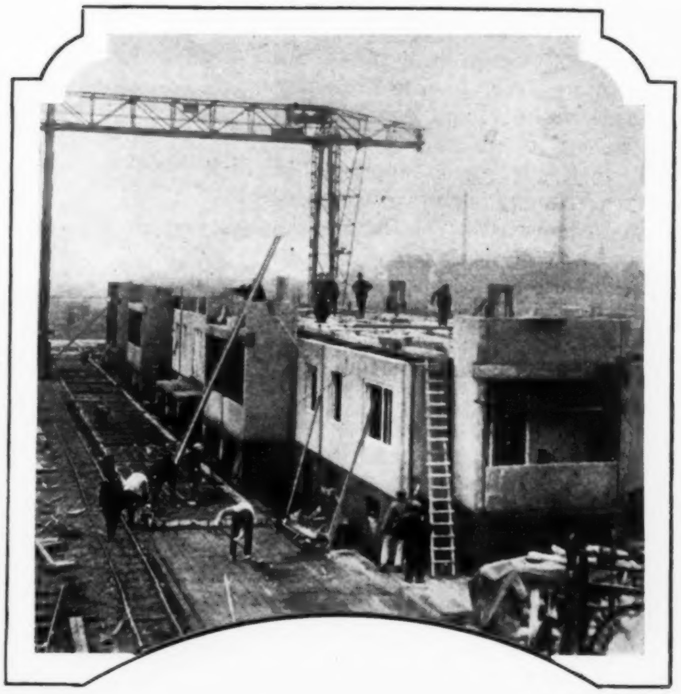
The Buffalo Slag Company finds it necessary to store its finished product during the winter season when the market is temporarily suspended, as the production of slag is a continuous process. This storage is accomplished by means of stock-piling the several grades of material in a large storage yard adjacent to the crusher. Western air dump cars of 30 cu.yd. capacity are used for handling the material economically. A train of these cars is backed under huge bins at the crusher and there loaded by gravity. The train is then switched out to one of several elevated dumping tracks and dumped in the usual way. The material is then picked up by a clamshell crane, moved back and piled into huge windrows, from which is loaded for shipment.

Air dump cars take slag from crusher. Insert shows the crusher building

Berlin Builds Houses in a Day



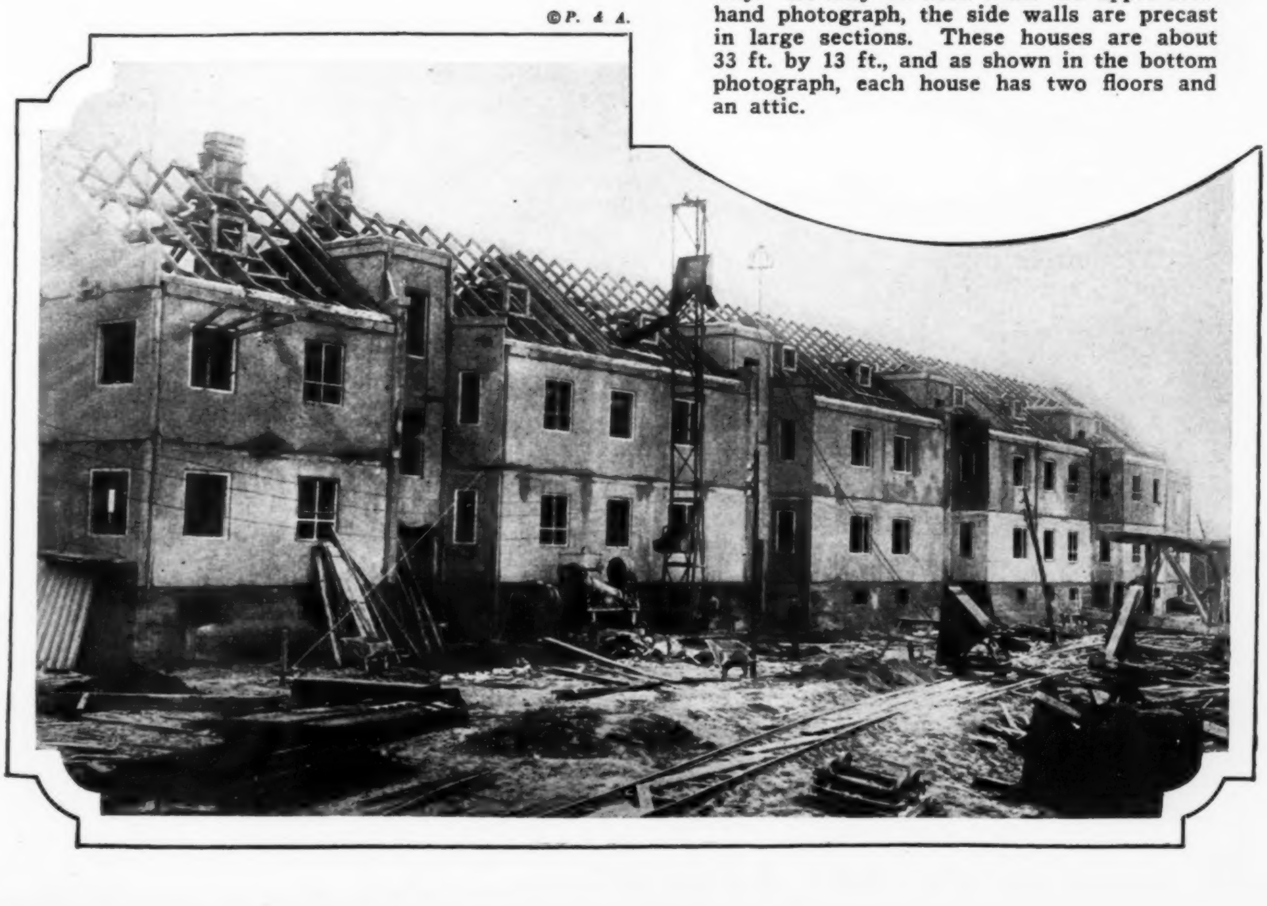
©P. & A.



©K. & H.

Houses built of concrete and composition board are being constructed in a suburb of Berlin at the rate of one dwelling every 24 hours. The three photographs on this page show the work of building these houses under way. As may be seen from the upper left-hand photograph, the side walls are precast in large sections. These houses are about 33 ft. by 13 ft., and as shown in the bottom photograph, each house has two floors and an attic.

©P. & A.



Tractor Operates Backfilling Machine

THE Hetch Hetchy Water Supply, which is primarily a project to bring 400,000,000 gallons of water daily from the Tuolumne River to San Francisco and its vicinity, has been planned to tie up so far as possible with existing sources of supply. The Hetch Hetchy aqueduct crosses San Francisco Bay at Dumbarton Strait and in order to make available water from sources already developed in Alameda County, the building of that section of the aqueduct extending from Irvington across the Bay to Crystal Springs Reservoir, has been undertaken in advance of the intermediate division. A steel pipe line, 60 in. in diameter and 19.4 miles long, is being constructed from Irvington to a point 3 miles west of Redwood City. The trench for the pipe was excavated with a bottom width of 6 ft. with 1 to 6 side slopes, the average depth being from 7 to 8 ft. All the trench, with the exception of a section in the Cordilleras Canyon where it was steel side hill work, was excavated with draglines, as shown in the upper photograph. As much as 700 ft. of trench, averaging 2 yd. per ft. was excavated in two 8-hr. shifts with one machine. The pipe

Above—Digging the Trench
Below—Covering the Big Pipe

was placed in the prepared trench by a Caterpillar type traveling crane. Each section as placed was entered into the adjoining section previously laid, and pinned. Crews followed bolting and laying up, riveting and caulking. The pipe was laid at the rate of 18 to 20 sections per day. Backfilling was done by means of a piece of equipment, shown in the lower photograph, which was especially designed for this job. It consists primarily of a power scraper, operated on an overhead track, supported by a truss, spanning the trench and spoil bank. The whole machine moves longitudinally along the trench on its own power. One end of the truss is supported on the chassis of a Caterpillar tractor and the other end on a pair of wheels which travel over the ground parallel to the trench. The tractor is equipped with a generator which supplies electric current for operating the motors. The dragline excavator in excavating the trench deposited the earth alongside the trench over a width of about 40 ft. As the Caterpillar tractor and truss traveled along the trench this earth was scraped into the trench by means of the scraper shown.

Portable Compressors Lined Up at Tunnel Mouth

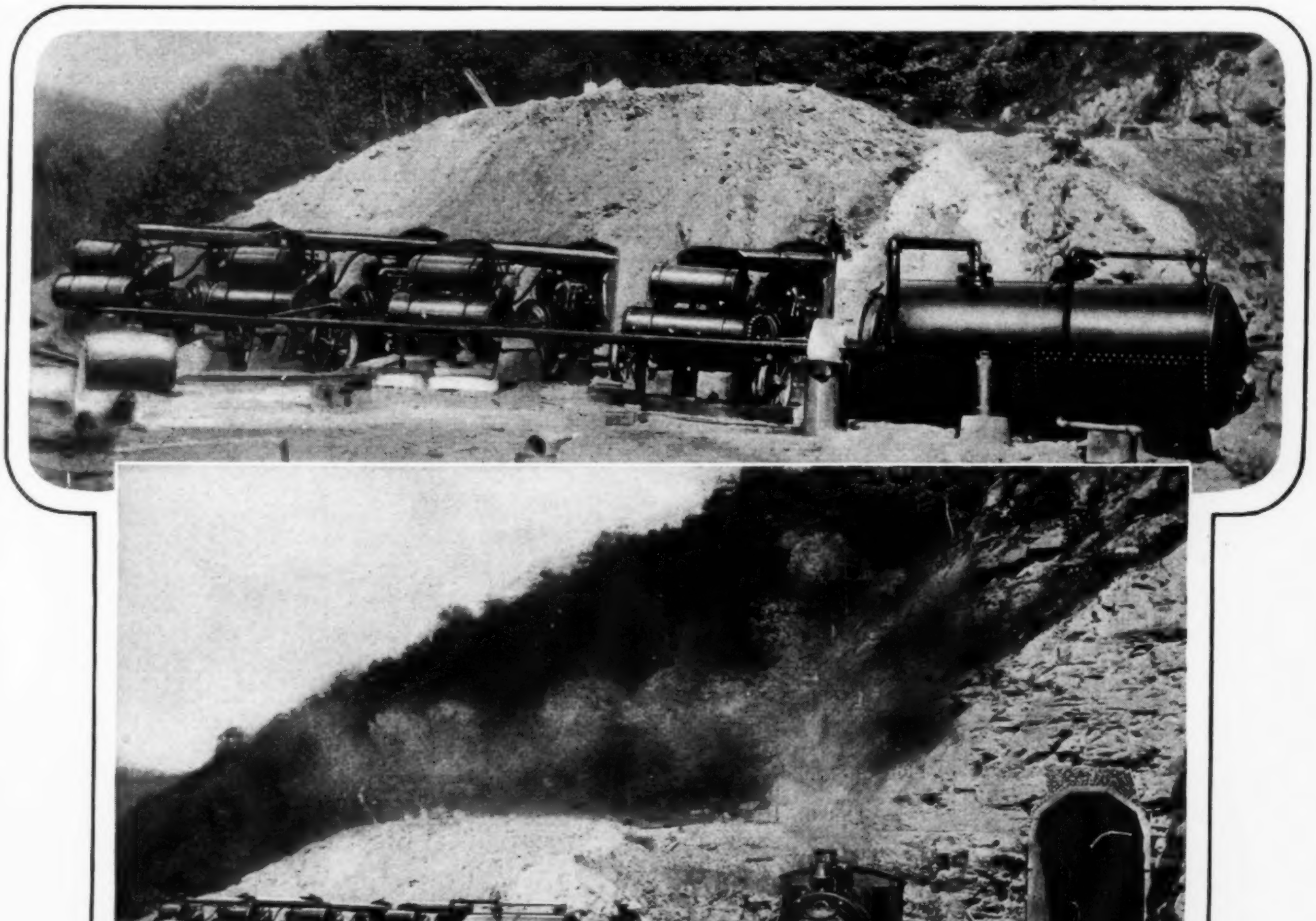
Flexibility of Air Supply Effects Economies in Rock Removal on Railway Job in West Virginia Mountain

CONTRACTORS will be interested in the new 1,200-ft. tunnel recently completed on the Big Sandy Line of the Norfolk & Western Railway, near Cassie, W. Va. Although complete details of the construction work are not yet available, the engineers who undertook the job have made known certain economies, among them some new methods which may suggest savings to users of compressed air.

The removal of a large amount of rock, scattered over several miles, was included in the contract covering the actual tunnel driving. As this rock removal required the use of pneumatic machinery, the installation of an efficient and economical air compressor plant was vital. This was especially true because of the fact that much of the work was to be carried on at outlying points. The Walton Construction Company, of Roanoke, Va., obtained the contract.

The installation of a central power plant, stationary in character, was first considered; but it soon was realized that this sort of compressor would prove impractical. The length of time required for putting in such a plant, added to the almost prohibitive cost of long pipe lines, led the contractors to decide upon portable compressors as the source of air power.

Four Ingersoll-Rand 9-in. by 8-in. portables were installed and put to work immediately on the rock work. After this had been completed, they were arranged as a battery, near the tunnel heading, so that they might discharge air into a single large receiver tank. The air thus supplied was used for the operation of a $\frac{3}{4}$-yd.



A quartette of portable compressors supply air for drilling tunnel

Erie tunnel mucker and several Jackhamer rock drills employed on bench work within the tunnel. The four compressors easily handled this work.

Mr. Rogers, president of Walton Construction Company, states that the idea worked out satisfactorily, and recommends it for similar projects where the points of operation are widely scattered. With portable compressors, his engineers were able to move the power plant along as occasion demanded. Had activities been confined to a small area, a stationary compressor would have been used; but in this case, the wide distances separating the tunnel from other points of the work made pipe lines distinctly undesirable.

The accompanying photographs show how the compressors and the large receiver were arranged at the tunnel heading.

Specially Equipped Trucks Handle Heavy Stone

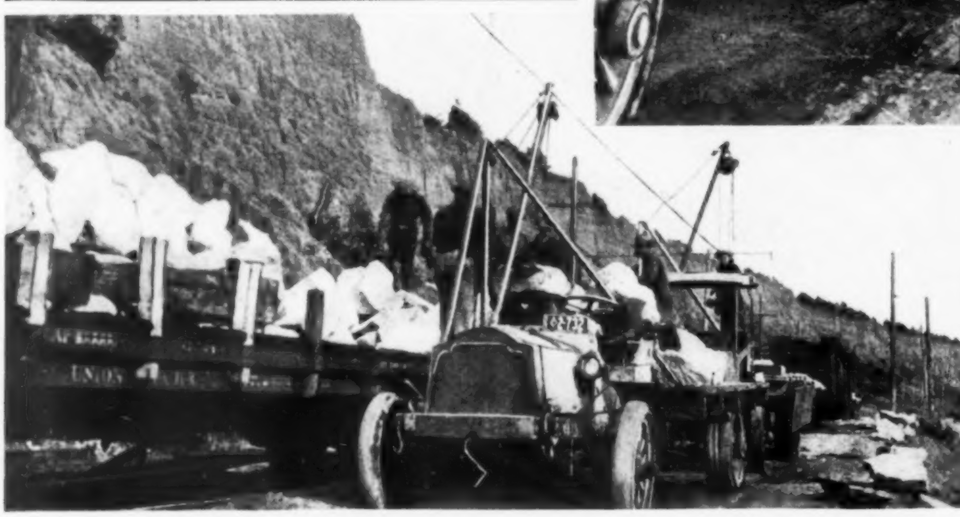
TO PREVENT further encroachment by the waves, more than 2,000 tons of heavy granite rip rap rock were placed by maintenance crews of the California Highway Commission at the foot of embankment slopes, along the Coast Boulevard north of Santa Monica. At this point the Boulevard runs along the edge of the Pacific. The constant battering of the waves has made the maintenance of the Coast Boulevard a difficult job ever since the road was built.

The trucks used for hauling the heavy rock were equipped with a stiff-leg boom, provided with chain block and stone hooks, which greatly facilitated the work. An inclined chute, hinged to the side of the truck and supported by posts when in use, was employed where necessary to chute the work over high embankments.

Rock was unloaded from flat cars, hauled an average of 3½ miles and placed in approximately its final position at a cost of 94 cents per ton.

The way in which the rock was hauled is clearly shown in the accompanying photograph. The upper picture is a close-up of the hinged chute and shows how the rock is thrown clear of the truck and over the side of the embankment. The lower photograph was taken at the point where the stone is unloaded from the freight cars to the trucks. The special stiff-leg boom equipment of the trucks which is described above may be clearly seen in this photograph.

Above — Hinged chute drops rock clear of truck



At left — Trucks getting stone from flat cars

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

JAMES H. McGRAW, President
JAMES H. McGRAW, Jr., Vice-Pres. and Treas.
MALCOLM MUIR, Vice-President
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
C. H. THOMPSON, Secretary.

WASHINGTON, Colorado Building
CHICAGO, 7 S. Dearborn Street
PHILADELPHIA, 16th and Parkway
CLEVELAND, Guardian Building
ST. LOUIS, Star Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie St., London, E. C. 4

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record American Machinist
Power Chemical and Metallurgical Engineering
Coal Age Engineering and Mining Journal-Press
Radio Retailing Ingeniería Internacional
Bus Transportation Electric Railway Journal
Electrical World Electrical Merchandising
Industrial Engineer Successful Methods
Journal of Electricity
(Published in San Francisco)
American Machinist—European Edition
(Published in London)

Subscription is two years for $1 to the United States, Canada, Mexico, Alaska, Hawaii, the Philippines, Porto Rico, Canal Zone, Cuba, Honduras, Nicaragua, Peru, Colombia, Bolivia, Chile, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra postage to other countries, $1 (total $2 or 9s. 4d.) for two years. Single copy, 5 cents.

Change of Address—When change of address is ordered the new and the old address must be given. Printed in U. S. A. Published monthly.

NUMBER OF COPIES PRINTED THIS ISSUE, 44,600